

**APPENDIX: CIGARETTE SMOKING IN  
THE UNITED STATES, 1950–1978.**

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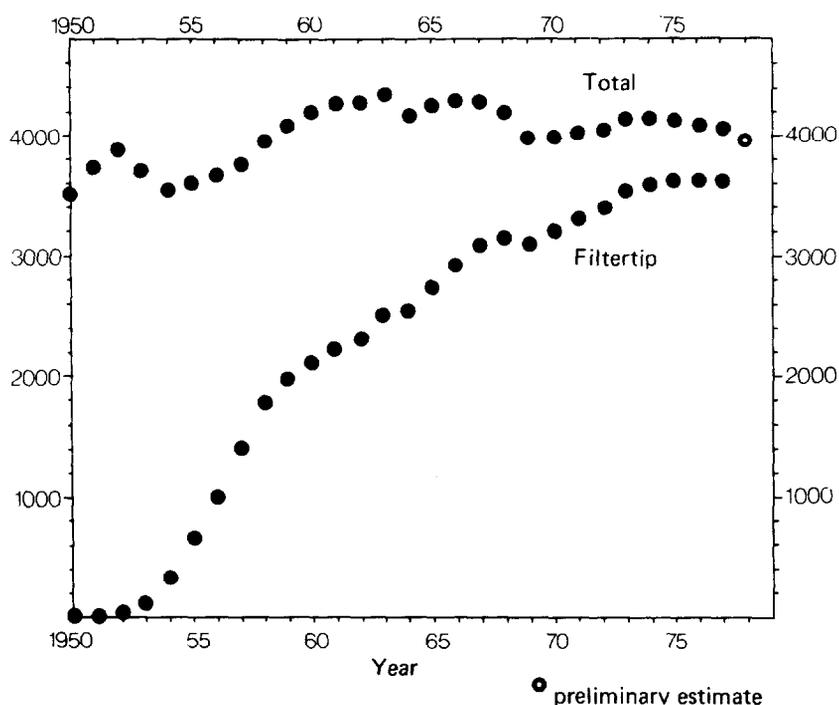
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## Introduction

During the past three decades, there have been numerous changes in the population of cigarette smokers, in the style of cigarette smoking, and in the composition of the cigarette product.



**FIGURE 1. Annual consumption of cigarettes and filtertip cigarettes per person aged 18 years and over, 1950—1978**

SOURCE: Miller, R.H. (32,33), U.S. Department of Agriculture (47-51).

## Per Capita Consumption

Figure 1 depicts the annual consumption of cigarettes per person aged 18 years and over for the period 1950 to 1978 (47-51). In addition to total per capita cigarette consumption, the per capita consumption of filtertip cigarettes is shown, as derived from annual data on the filtertip share of total cigarette production (32, 33, 47-51). The choice of a population base of potential smokers aged 18 years and over is necessarily somewhat arbitrary; however, results qualitatively similar to those depicted in Figure 1 are obtained when a population base aged 12 years and over is used.

During the period 1925 to 1950 (not shown in Figure 1), annual per capita consumption increased steadily from 1,285 to 3,522 cigarettes

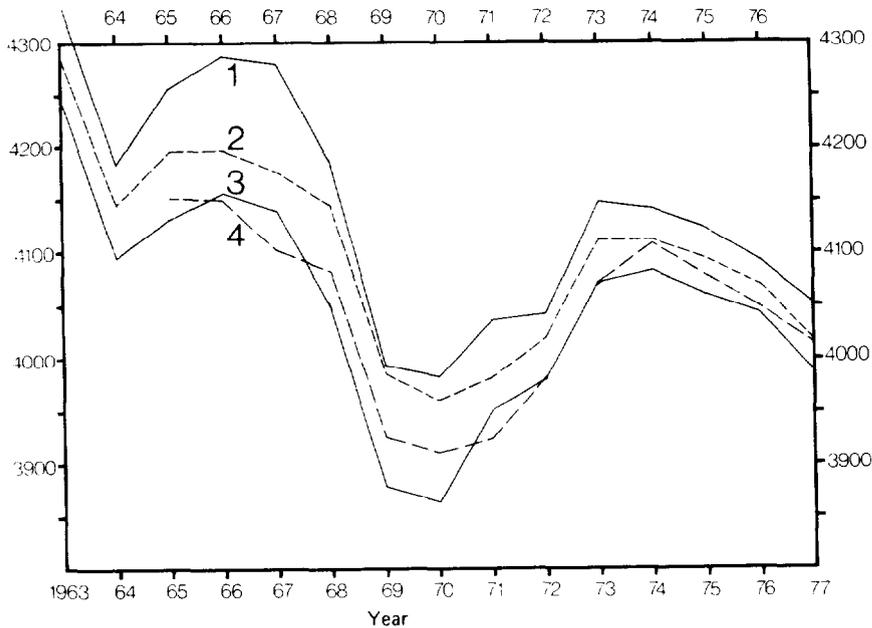
per person aged 18 years and over. As shown in Figure 1, annual per capita consumption declined temporarily in 1953 and 1954, but then continued to increase to a peak value of 4,336 in 1963. Per capita consumption again declined temporarily in 1964 and from 1968 to 1970. Since 1973, per capita consumption has declined at an average rate of about 0.9 percent annually. The preliminary estimate for 1978 is 3,965 cigarettes per person aged 18 years and over, which represents the lowest recorded value of per capita consumption since 1958.

Figure 2 describes in more detail the observed changes in cigarette consumption from 1963 to 1977. Four alternative per capita consumption series are shown. Series "1" in Figure 2 duplicates the total per capita consumption series of Figure 1. This series, reported by the Department of Agriculture (47-51), is based upon federal taxable removals, plus domestic tax-exempt deliveries, plus shipments to U.S. overseas forces, plus imports. Because the federal excise tax is applied to cigarettes transferred from manufacturers' factories to regional warehouses where they await distribution to wholesalers, these data may differ from actual cigarette consumption. Since 1970, the Department of Agriculture has adjusted this series for estimated changes in warehouse inventory.

Series "2" in Figure 2 represents total per capita consumption reported by the Federal Trade Commission (68,69), based upon reports of cigarette sales filed by individual manufacturers pursuant to the Public Health Cigarette Smoking Act. Series "3" represents domestic per capita consumption, calculated from Department of Agriculture data, in which shipments to U.S. overseas forces are excluded from total consumption, and in which overseas forces are excluded from the population base (52). Finally, Series "4" is calculated from total domestic consumption, gross of inventory adjustment, as published in various Maxwell Reports (27-30).

Despite different methods of measurement, all four time series reveal a temporary decline in 1964, a more marked, temporary decline from 1968 to 1970 (which may have actually begun as early as 1966), and a continuing decline after 1973. The observed declines in per capita consumption are not attributable to changes in inventories, cigarette imports, or shipments to overseas forces.

The temporary declines in total per capita consumption in 1953-54 (Figure 1), 1964, and 1968-70 (Figures 1 and 2) are of particular interest because they coincide with periods of increased publicity concerning the health hazards of cigarette smoking. Reports seriously suggesting a link between cigarette smoking and lung cancer first appeared in the popular press in 1953 and 1954 (10, 25, 31, 36). The first report of the Advisory Committee to the Surgeon General appeared in January 1964 (53). The Federal Cigarette Labelling and Advertising Act (P.L. 89-92), requiring a health warning in all advertising and on every package, became effective July 1966 (1, 34). In June 1967, the



**FIGURE 2. Annual consumption of cigarettes per person aged 18 years and over, 1963—1977**

1. Based on Department of Agriculture total U.S. consumption series.
2. Based on Federal Trade Commission consumption series.
3. Based on Department of Agriculture domestic consumption series.
4. Based on Maxwell Reports' domestic consumption series.

SOURCE: Federal Trade Commission (68,69), Maxwell, J.C.C. (27—30), U.S. Department of Agriculture (47—51), U.S. Department of Commerce, Bureau of the Census (52).

Federal Communications Commission, applying the Fairness Doctrine to cigarette advertising, ruled that broadcast stations carrying cigarette commercials must devote a significant amount of time to informing listeners of the health hazards of smoking (1, 7, 34). In November 1967, the Federal Trade Commission issued its first periodic report on "tar" and nicotine contents of the cigarette smoke of various brands (67). In March 1969, the Federal Communications Commission ruled that television stations must present a significant number of anti-smoking messages during prime viewing hours when cigarette commercials were presented (1, 34). The value of these anti-smoking messages was estimated at \$75 million. In April 1970, the Public Health Cigarette Smoking Act (P.L. 91-222) strengthened the health warning required in cigarette advertisements and packages and banned broadcast cigarette commercials starting January 2, 1971. These and other government actions were bolstered by those of numerous public and private organizations which took stands against cigarette smoking and began their own anti-smoking initiatives (1).

Although these events are often cited as being coincident with the observed declines in per capita consumption, there is disagreement concerning their actual quantitative impact on cigarette use (12, 16, 17, 24, 27, 32-35, 74). Of particular significance is the possible effect of broadcast anti-smoking messages during 1968 to 1970. As a result of application of the Fairness Doctrine, the statutory ban on broadcast cigarette advertisements virtually eliminated anti-smoking messages from prime viewing hours after 1971 (66). Some studies have in fact attributed the subsequent increase in consumption in 1972 and 1973 (see Figures 1 and 2) to the discontinuation of these anti-smoking commercials (16, 17). The statistical technique employed to isolate such anti-smoking publicity effects has been the inclusion of a binary explanatory variable in the time series analysis of per capita cigarette consumption (5, 6, 24, 32-35, 74). This variable is assigned a value of 1 during those years in which the anti-smoking publicity occurred (usually 1953-54, 1964, and 1968-69) and a value of 0 in all other years. However, such a technique only tests the hypothesis that some additional factors affected cigarette consumption in those years. Even if one can reasonably attribute these effects to a single intervention, such as the anti-smoking television messages, it may not be appropriate to confine the quantitative influence of such commercials solely to the month or year of its occurrence (39).

Most important, analyses of aggregate per capita consumption provide little direct insight into the impact of these public policy actions on individual smoking decisions.

### **The Prevalence of Cigarette Smoking**

Table 1 summarizes the results of several different surveys of tobacco use in the adult U.S. population during the period 1949 to 1978. As indicated in the notes to Table 1, these surveys differ in sampling techniques, possible inclusion of proxy respondents, use of telephone versus direct interview techniques, eligible respondent age, and in those questions asked to identify regular, current cigarette smokers. In addition to these studies, prevalence data are available from isolated, one-time surveys (13, 46), and from large-scale epidemiological studies (19-22), but these may not be representative of the entire U.S. population. Detailed surveys of adult use of cigarettes have also been performed for marketing purposes.

The survey results in Table 1 must be interpreted in light of possible non-response biases or possible underreporting of smoking (75). In particular, comparison of the post-1969 survey data of the American Institute of Public Opinion (Gallup Poll) with the other series suggests that not all individuals who smoke cigarettes during any single week would consider themselves "regular" smokers. Nevertheless, despite numerous differences in methodology, the results in Table 1 present a

TABLE 1.—Estimates of the percentage of current, regular cigarette smokers, adults, United States, 1949—1978

Year	Supplement to Current Population Survey <sup>1</sup> (17 yrs. and over)			Health Interview Survey <sup>1,2</sup> (17 yrs. and over)			National Clearinghouse for Smoking & Health <sup>3,4</sup> (21 yrs. and over)			Gallup Poll <sup>5</sup> (18 yrs. and over)		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1949										44		
1954										45		
1955	37.6 <sup>6,7</sup>	52.6	24.5									
1967										42	52	34
1968										45		
1964							40.3	52.9	31.5			
1965				41.7 <sup>8</sup>	51.1	33.3						
1966	40.6 <sup>4</sup>	50.0	32.3				42.2	51.9	33.7			
1967	40.1 <sup>4</sup>	49.1	32.1									
1968	38.6 <sup>4</sup>	47.0	31.2									
1969										40	44	36
1970				36.9 <sup>9</sup>	43.5	31.1	36.2	42.3	30.5			
1971										42	47	37
1972										43	48	38
1973										40		
1974				37.0 <sup>9,10</sup>	42.7	31.9				40	45	36
1975							33.8	39.3	28.9			
1976				36.7 <sup>4,10</sup>	41.9	32.0						
1977										38	41	36
1978				33.2 <sup>4,11</sup>	37.5	29.6				36	39	34

<sup>1</sup> Results displayed as percentage of respondents with known smoking status.

<sup>2</sup> Both self and proxy respondents in 1966 and 1970. Only self-respondents in 1974, 1976, and 1978.

<sup>3</sup> Personal interviews in 1964 and 1966. Telephone surveys supplemented by personal interviews in 1970 and 1975.

<sup>4</sup> Current smokers defined as those responding affirmatively to: "Do you now smoke?"

<sup>5</sup> In 1967, current smokers defined as those responding "cigarettes" to the question: "Do you smoke cigarettes, a pipe, cigars, or don't you smoke?" Individual percentages for males and females in 1967, however, also included cigar and pipe smokers. For 1969 and later years, current smokers defined as those responding affirmatively to: "Have you, yourself, smoked any cigarettes in the past week?" In other years, definition of current smoker not provided in report.

<sup>6</sup> Current smokers defined as those smoking at least one cigarette everyday.

<sup>7</sup> Ages 18 years and over.

<sup>8</sup> Current smokers defined as those respondents who reported a current rate of smoking.

<sup>9</sup> Data provided by Health Interview Survey, National Center for Health Statistics.

<sup>10</sup> Ages 20 years and over.

<sup>11</sup> Preliminary estimate based on sample of over 4,400 respondents during July - September 1978. Data provided by Health Interview Survey, National Center for Health Statistics.

SOURCE: American Institute of Public Opinion (2-4), Bonham, G.S. (8), Haenszel, W. (15), National Center for Health Statistics (55-59), National Clearinghouse for Smoking and Health (60,62,64)

**TABLE 2.—Estimated percentages of current and former smokers, adults, according to age and sex, United States, 1955—1975**

	1955		1964		1966		1970		1975	
	Current smoker	Former smoker								
<b>Males</b>										
21-24	51.4*	3.6*	67.0	9.5	61.9	7.2	49.8	20.0	41.3	16.0
25-34	63.4	9.0	59.9	18.0	59.9	19.7	46.7	27.9	43.9	22.5
35-44	62.1	11.1	59.9	22.9	59.0	21.9	48.6	31.4	47.1	25.8
45-54	56.9	12.6	53.1	25.3	53.8	26.0	43.1	34.4	41.1	36.0
55-64	43.6	15.7	50.9	24.5	47.7	31.0	37.4	41.4	33.7	38.8
65+	22.3	13.6	29.9	27.0	27.8	29.5	22.8	43.8	24.2	36.2
All ages	52.6	10.9	52.9	22.2	51.9	23.6	42.3	32.6	39.3	29.2
<b>Females</b>										
21-24	29.7*	3.5*	41.9	7.6	49.2	7.9	32.3	13.2	34.0	19.9
25-34	35.8	5.8	40.6	9.3	45.1	12.0	40.3	18.9	35.4	16.5
35-44	32.4	4.9	39.2	9.4	40.6	10.5	38.8	15.8	36.4	17.7
45-54	22.8	3.9	36.4	6.8	42.0	9.6	36.1	15.5	32.8	15.5
55-64	10.8	2.6	20.5	7.0	20.6	10.5	24.2	16.0	25.9	15.0
65+	3.5	1.6	7.8	3.3	7.6	5.2	10.2	8.2	10.2	10.7
All ages	24.5	3.9	31.5	7.4	33.7	9.4	30.5	14.8	28.9	14.5

\*Ages 18-24 for 1955 only.

SOURCE: Haenszel, W. (15), Green, D. (14), National Clearinghouse for Smoking and Health (60,62,64).

consistent picture. The prevalence of male adult cigarette smoking has declined significantly. The prevalence of female adult cigarette smoking appears to have increased from 1955 to 1965. Since then, it has declined by no more than 3 or 4 percentage points.

The decline in the prevalence of smoking was most significant during 1965 to 1970, and particularly striking for males during 1968 to 1970. (Except for 1978, the absolute standard errors of the Current Population Survey estimates and the Health Interview Survey estimates were less than 0.3 percent.) Much less significant changes in prevalence were observed from 1971 to 1974. Since 1974, however, the prevalence of adult smoking has continued to decrease. Preliminary estimates from the 1978 Health Interview Survey suggest a very recent significant decline in both male and female smoking. (The absolute standard errors of the 1978 preliminary Health Interview Survey estimates were 1.1 percent for males, 0.9 percent for females, and 0.7 for both sexes.) This conclusion is supported by the Gallup Poll results for 1974, 1977, and 1978. These preliminary findings indicate that in 1978 the prevalence of cigarette smoking among adults reached its lowest recorded point in over 30 years.

As a result of population growth, this net decline in the prevalence of adult cigarette smoking is not necessarily matched by a decline in the absolute number of cigarette smokers. Although the percentage of adults who regularly smoke cigarettes fell from an estimated 41.7 percent in 1965 to an estimated 33.2 percent in 1978 (Health Interview Survey data in Table 1), the total number of U.S. resident cigarette smokers aged 17 and over increased from an estimated 53.3 million in 1965 to an estimated 54.1 million in 1978. This relatively small change represented the net effect of an estimated 8.5 percent decrease in the absolute number of adult male smokers and an estimated 11.1 percent increase in the absolute number of adult female smokers.

The pattern of changes in the prevalence of adult cigarette smoking, as shown in Table 1, corresponds qualitatively to the observed changes in per capita consumption over time, as depicted in Figures 1 and 2. In general, changes in the number of cigarette smokers represent the net effect of new initiation of smoking, cessation of smoking, recidivism, and exit from the population by emigration or death. A detailed, longitudinal analysis of changes in individual smoking habits would be required to distinguish accurately among these sources of change in smoking prevalence. Such a longitudinal analysis of changes in individual smoking for the past 10 to 15 years has not been published. However, follow-up data from continuing prospective epidemiological studies (e.g., 19-22) may be a potential source of this type of information. In the absence of a long-term, longitudinal study, an analysis of changes in the prevalence of cigarette smoking must rely upon serial cross-sections of different individuals.

Table 2 presents estimates of the percentages of current and former adult cigarette smokers, by age and sex, for the period 1955 to 1975. In this table, the results of the 1955 Current Population Survey have been combined with those from the 1964, 1966, 1970, and 1975 National Clearinghouse for Smoking and Health surveys. These data permit an approximate assessment of changes in smoking habits for a given age/sex category over time. For example, the percentage of adult female current smokers, aged 55 to 64, has increased progressively from 1955 to 1975. The data also permit an approximate analysis of changes in smoking habits among 10-year birth cohorts. For example, in 1955, 62.1 percent of males born from 1920 to 1929, then aged 35 to 44, were current smokers. By 1965, the prevalence of current smoking among the same birth cohort, then ages 45 to 54, was about 53.5 percent (the population-weighted average of 1964 and 1966). By 1975, the prevalence of current smoking among this birth cohort, then aged 55 to 64, was 33.7 percent.

Among adult males, the percentage of current smokers for each birth cohort has declined, while the percentage of former smokers has increased. Changes in the percentage of those who have never smoked depend on the particular cohort. For example, the percentage of those born from 1920 to 1929 who never smoked decreased from 26.8 percent in 1955 to 20.9 percent in 1965, presumably as more individuals began but later quit smoking. From 1965 to 1975, however, the percentage of those born from 1920 to 1929 who never smoked increased to 27.5 percent. This finding is consistent with—but does not prove—the hypothesis of a longer life expectancy among those who have never smoked. Moreover, as the prevalence of cigarette smoking among older birth cohorts continues to decline, the prevalence of smoking among new, younger male birth cohorts has also been declining. (The prevalence data for the youngest age group in 1955 represent individuals aged 18 to 24, as opposed to ages 21 to 24 for other survey years, and cannot be strictly compared.)

Among female birth cohorts, there is also a general but less marked decline in smoking prevalence, which is accompanied by an increase in the percentage of former cigarette smokers. The prevalence of smoking among females in the older age groups has increased, as women born from 1910 to 1939 replaced those born from 1890 to 1909. As in the case of men, the percentage of women born from 1920 to 1929 who never smoked decreased from 62.7 percent in 1955 to 52.9 percent in 1965 and then increased to 59.1 percent in 1975. Again, this finding is consistent with—but does not prove—the hypothesis of a longer life expectancy among women who have never smoked cigarettes. In contrast to the case of men, the decline in prevalence of smoking among new, younger female birth cohorts is less consistent.

A decline in the percentage of current smokers and an increase in the percentage of former smokers, as shown in Table 2, suggests that

**TABLE 3.—Estimates of the percentage of recent former cigarette smokers, adults, 1964, 1966, 1970, and 1975, United States**

Year	Percentage of adults who quit smoking within 1 year of survey			Percentage of adults who quit smoking within 2 1/2 years of survey		
	Total	Male	Female	Total	Male	Female
1964 (Fall)	2.6	4.3	1.5	4.9	7.6	3.1
1966 (Spring)	2.2	2.8	1.7	4.6	6.1	3.3
1970 (Spring)	4.2	5.6	2.9	8.1	10.6	5.8
1975 (Summer)	2.1	2.4	1.8	3.1	4.5	2.8

SOURCE: National Clearinghouse for Smoking and Health (60,62,64).

the cessation of cigarette smoking was a significant factor in explaining the overall decline in smoking prevalence. This finding has been supported by a similar analysis of changes in smoking prevalence from the Health Interview Survey data (8).

Table 3 presents estimates of the percentage of recent, former cigarette smokers, obtained during the survey years 1964, 1966, 1970, and 1975. These data reflect the responses of adults who had discontinued smoking within 1 year or within 2½ years of the survey date. These results must be interpreted in light of possible errors in respondents' recall of recent smoking behavior. Nevertheless, the results are strongly consistent with the conclusion that the cessation of cigarette smoking was a major factor in the decline in smoking prevalence, especially during the period 1966 to 1970. These results also suggest that the cessation of cigarette smoking was a major factor in the observed decline in per capita consumption during 1968 to 1970 (Figure 2), and possibly in 1964.

The great majority of adult cigarette smokers begin regular smoking before the age of 21 (41,60,62,64). Therefore, an examination of teenage smoking prevalence would contribute to the understanding of recent changes in the initiation of cigarette smoking. Table 4 presents estimates of the percentage of current, regular cigarette smokers among teenagers aged 12 to 18, as determined from surveys conducted by the National Clearinghouse for Smoking and Health (61,63,65). In addition to these surveys, there have been numerous other studies of teenage smoking habits in specific geographic regions or among specific teenage population groups, such as high school students (11,23,40,41,46,71). Comparison of these studies, however, is made particularly difficult by variations in study definitions of current, regular teenage smokers (11,12,77). In the surveys cited in Table 4, current, regular teenage smokers include those who regularly smoke cigarettes at least once per week.

**TABLE 4.—Estimates of the percentage of current, regular cigarette smokers, teenagers, aged 12 to 18, United States, 1968—1974**

Year	Ages 12-14		Ages 15-16		Ages 17-18		Ages 12-18	
	Male	Female	Male	Female	Male	Female	Male	Female
1968	2.9	0.6	17.0	9.6	30.2	18.6	14.7	8.4
1970	5.7	3.0	19.5	14.4	37.3	22.8	18.5	11.9
1972	4.6	2.8	17.8	16.3	30.2	25.3	15.7	13.3
1974	4.2	4.9	18.1	20.2	31.0	25.9	15.8	15.3

NOTE: Current regular smoker includes respondent who smokes cigarettes at least weekly.  
SOURCE: National Clearinghouse for Smoking and Health (61,63,65).

Table 4 indicates that there was little overall change in the prevalence of current regular smoking among teenage males during 1968 to 1974. By contrast, the percentage of teenage female smokers has significantly increased. For both sexes, the small but significant increase in smoking prevalence among those 12 to 14 years old suggests that the average age of initiation of cigarette smoking is declining.

Other nationwide studies of teenage smoking have been recently conducted, including studies sponsored by the American Cancer Society in 1969 and 1975 (26,54,79), and a study conducted as part of the Gallup Youth Survey (4). A comparison of the two American Cancer Society studies confirms the general findings of an increase in smoking prevalence among teenage females and of little change in the smoking prevalence among teenage males. However, these studies employed definitions of a current, regular smoker which differ from those used by the National Clearinghouse for Smoking and Health.

Table 5 presents the observed changes in smoking prevalence among white and black adults, derived from the Health Interview Survey (59). The prevalence of smoking declined among male adults of both races. The prevalence data for females are more difficult to interpret.

Table 6 presents the observed changes in smoking prevalence among adults according to level of educational attainment, as reported by the National Clearinghouse for Smoking and Health (60,62,64). The prevalence of adult male smoking declined among all educational groups. The prevalence of adult female smoking declined among all groups except those with grade school education or less. The decline was more marked among those women who graduated from college. It is noteworthy that the prevalence of smoking among adults who graduated from college declined significantly during the years 1964 to 1966, whereas the observed declines in prevalence among other educational groups were generally confined to later years.

**TABLE 5.—Estimates of the percentage of current, regular cigarette smokers among white and black adults, aged 20 years and over, United States, 1965—1976**

Year	White		Black	
	Male	Female	Male	Female
1965	51.5	34.2	60.8	34.4
1970	43.7	31.9	54.0	33.1
1974	41.9	31.8	55.3	36.8
1976	41.2	31.8	50.5	35.1

NOTE: Results displayed as percentage of respondents with known smoking status.  
SOURCE: National Center for Health Statistics (59).

**TABLE 6.—Estimates of the percentage of current, regular cigarette smokers among adults, aged 21 years and over, according to highest level of educational attainment, United States, 1964—1975**

	1964	1966	1970	1975
<b>Males</b>				
1. Grade school or less	49.5%	49.9%	39.2%	37.4%
2. Some high school	62.0	60.4	51.0	47.8
3. High school graduate	56.8	55.1	47.7	45.6
4. Some college	50.4	53.4	37.3	36.1
5. College graduate	42.5	36.8	30.6	28.1
<b>Females</b>				
1. Grade school or less	18.2	18.2	19.7	18.2
2. Some high school	36.5	39.8	34.4	33.2
3. High school graduate	35.4	43.2	32.2	31.9
4. Some college	36.1	35.9	36.3	32.2
5. College graduate	35.0	28.2	26.0	21.1

SOURCE: National Clearinghouse for Smoking and Health (60,62,64).

Table 7 shows the prevalence of current, regular cigarette smoking among adults aged 20 years and over according to family income, selected occupational groups, and marital status for 1976 (8). Among adult males with higher family incomes there is a lower prevalence of smoking. By contrast, the prevalence of adult female smoking increases with family income. This finding is reproduced in the surveys conducted by the National Clearinghouse for Smoking and Health (60,62,64). The prevalence of smoking among professionals is relatively low for both sexes. It is also relatively low for those not in the labor force, which includes students and housewives. By contrast, managers

**TABLE 7.—Estimates of the percentage of current, regular cigarette smokers, adults aged 20 years and over, according to family income, selected occupation groups, and marital status, United States, 1976**

Category	Male	Female
1. Family income		
Under \$5,000	42.5	28.3
\$5,000 to 9,999	45.5	33.5
\$10,000 to 14,999	45.5	32.5
\$15,000 to 24,999	40.4	33.0
\$25,000 or more	34.7	35.1
2. Occupation groups		
White collar	36.6	34.3
Professional, technical and kindred workers	30.0	29.1
Managers and administrative, non-farm	41.0	41.6
Sales workers	39.9	38.1
Clerical and kindred workers	40.4	34.8
Blue collar <sup>1</sup>	50.4	39.0
Farm	36.9	31.3
Currently unemployed	56.8	40.0
Not in labor force	32.9	28.2
3. Marital Status		
Never married	40.1	28.3
Currently married	41.1	32.4
Widowed	32.6	20.4
Separated	63.3	45.1
Divorced	59.9	54.8

<sup>1</sup>Craftsmen and kindred workers, operatives including transport, non-farm laborers.  
SOURCE: Bonham, G.S. (8).

and administrative personnel have higher prevalence rates. In this occupational group, in fact, the percentage of current regular female smokers exceeds that for adult males. Prevalence rates are also especially high for blue-collar workers and those currently unemployed. Those individuals who are either separated or divorced have higher prevalence rates. The prevalence of smoking among currently married women is somewhat higher than that of single women.

Although the survey results of the National Clearinghouse for Smoking and Health permit a similar trend analysis for these socio-economic groups, relatively large standard errors for many categories permit few strong conclusions. In general, the decline in the prevalence of smoking among adult males occurred in all socio-economic groups. A similar, but less consistent conclusion applies to adult females.

Beyond publication of these nationwide survey results in tabular form, little detailed analysis of the data has been performed. Hence,

more specific conclusions concerning trends among certain high-risk groups cannot be drawn.

### **Cigarette Dosage and Product Changes**

Comparison of the net changes in per capita consumption (Figure 2) with net changes in the prevalence of smoking (Tables 1 and 4) suggests that the percentage of smokers has declined to a greater extent than the per capita consumption of cigarettes. This finding must be interpreted in light of possible underreporting in surveys. It is possible that many of those respondents recorded as former smokers in a particular survey had quit smoking only temporarily. Nevertheless, this finding suggests an overall increase in the number of cigarettes consumed per current smoker.

Table 8 presents estimates of the percentage of adult, current, regular cigarette smokers who reported they consumed more than one pack per day. Table 9 presents estimates of the percentage of teenage current, regular cigarette smokers who reported they consumed more than one-half pack per day. Because the existing adult survey data differ in eligible age group, reported ranges of cigarette consumption, and the percentage of those respondents with unknown consumption, the results of three different adult surveys are displayed separately. The results of Tables 8 and 9 are consistent with the hypothesis that the number of cigarettes consumed by the average cigarette smoker has increased over time. This conclusion applies to both sexes, especially to females.

Possible explanations for an increase in cigarette consumption frequency include the following: (1) Lighter cigarette smokers may have a higher rate of discontinuation than heavier smokers. Hence, discontinuation by lighter smokers would result in a higher proportion of heavier smokers remaining. (2) Those who continue to smoke might increase their consumption. (3) New entrants into the current smoking population may be consuming more cigarettes than established current smokers.

The available studies neither clearly exclude nor clearly prove any one of these hypotheses. It is possible that different explanations apply to different age and sex groups. Hammond and Garfinkel, reporting on the 2-year follow-up of the American Cancer Society study (20), noted an increase in the proportion of female current smokers who smoked more than one pack per day but no clear-cut change among male current smokers. In their 6-year follow-up report (22), they noted that, for male smokers, the proportion of light smokers who quit smoking was far greater than the proportion of heavy cigarette smokers who gave up the habit. This conclusion does not appear to be an artifact produced by the practice of decreasing the number of cigarettes one smokes prior to quitting (21). On the other hand, the evidence

**TABLE 8.—Estimates of the percentage of current, regular cigarette smokers who consume more than one pack per day, adults, United States, 1955—1976**

Year	Supplement to Current Population Survey (17 yrs. and over) 21 cigarettes or more daily			Health Interview Survey (17 yrs. and over) 25 cigarettes or more daily			National Clearinghouse for Smoking and Health (21 yrs. and over) 25 cigarettes or more daily		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
1955	20.2 <sup>1</sup>	25.5	9.8				25.7	32.4	17.7
1964				19.9	24.5	13.7			
1965									
1966	21.6	26.3	15.7				27.2	34.7	16.9
1967	21.9	26.2	16.3						
1968	22.4	26.5	16.8						
1970				23.3	27.6	18.1	25.2	31.1	17.1
1974				24.7 <sup>2</sup>	30.3	18.4			
1975							30.1	36.0	22.8
1976				25.3 <sup>3</sup>	30.8	19.4			

<sup>1</sup>18 years and over.

<sup>2</sup>Data provided by Health Interview Survey, National Center for Health Statistics.

<sup>3</sup>20 years and over.

SOURCE: National Center for Health Statistics (55-59), National Clearinghouse for Smoking and Health (60,62,64).

**TABLE 9.—Estimates of the percentage of current, regular cigarette smokers who consume 10 or more cigarettes daily, teenagers, aged 12 to 18, United States, 1968—1974**

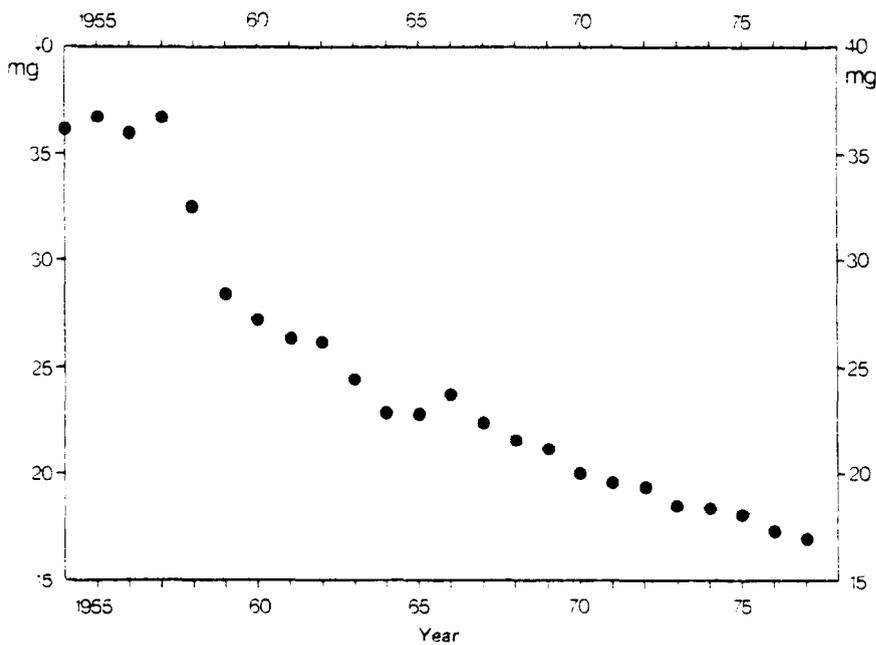
Year	Males	Females	Total
1968	45.7	39.0	43.2
1970	43.4	43.7	43.5
1972	54.0	47.3	50.9
1974	66.8	56.4	61.7

NOTE: Current regular smoker includes respondent who smokes cigarettes at least weekly.

SOURCE: National Clearinghouse for Smoking and Health (61,63,65).

supporting the hypothesis that a higher proportion of female light smokers quit smoking was not clear-cut.

The observation of an increase in the percentage of heavier smokers is particularly relevant because it parallels certain significant changes in the composition of the cigarette product. In the years following the initial publicity concerning the health hazards of cigarettes, in 1953



**FIGURE 3. Sales weighted average "tar" per cigarette, 1954—1977**

SOURCE: Consumers Union (9), Hammond, E.C. (20), Maxwell, J.C.C. (27—30), Owen, T.B. (38), Philip Morris, Inc. (39a), U.S. Federal Trade Commission (67) Wakeham, H. (73), Weber, K.H. (76), Wynder, E.L. (78).

and 1954, the consumption of filtertip cigarettes increased rapidly (Figure 1). By the time of the first Surgeon General's Report (1964), 65 percent of current smokers reported that they smoked filtertip brands (60). By 1975, 85 percent of current smokers consumed filtertip brands (64). From 1964 to 1977, the market share of filtertip cigarettes increased from 60 percent to 90 percent.

At the same time, the "tar" and nicotine contents of cigarettes have declined. This trend is illustrated in Figure 3, which depicts the sales-weighted average "tar" delivery per cigarette from 1954 to 1977 (9, 20, 27—30, 38, 39a, 67, 70, 73, 76, 78). For the years after 1967, periodic measurements of cigarette "tar" by the Federal Trade Commission (67) permit reliable calculations of sales-weighted average "tar" delivery. Prior to 1967, calculations of average "tar" are necessarily based upon reports of less standardized measurements. The results in Figure 3 for this period are based upon those reported by Wakeham (73), Weber (76), and Philip Morris, Inc. (39a). (See also Figures 15 and 16 of Chapter 14.)

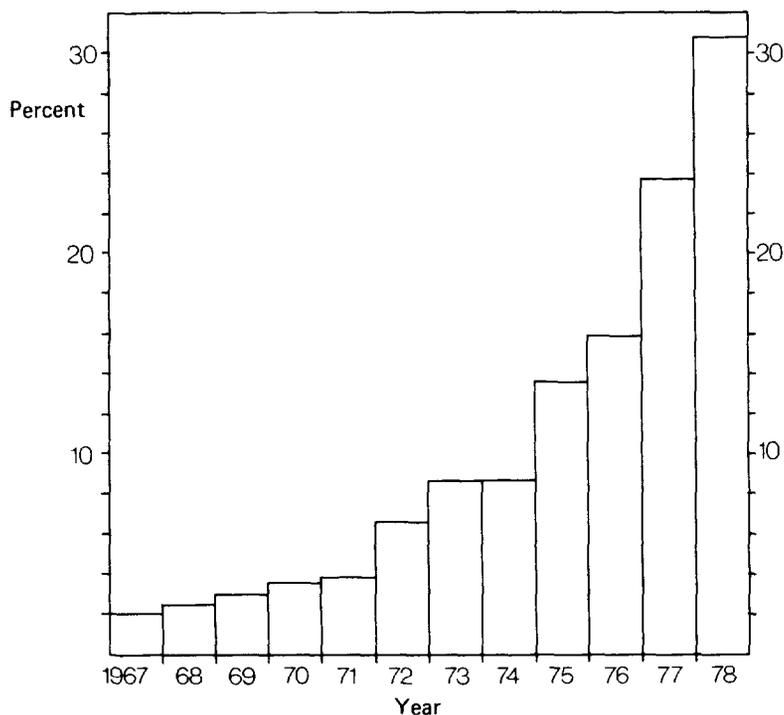
From 1954 to 1965, sales-weighted average "tar" decreased from approximately 37 mg to approximately 23 mg. Although this change

paralleled the rapid increase in filtertip market share, it also reflected a decrease in the "tar" content of both filtertip and nonfilter cigarettes. Since 1966, the sales-weighted average "tar" has continued to decrease. However, the overall percentage change in average "tar" delivery for the period 1966 to 1977 has been much less than the percentage change in average "tar" from 1957 to 1965 (Figure 3). The observed decreases in sales-weighted average "tar" have been paralleled by declines in the sales-weighted nicotine per cigarette. Over the period 1959 to 1978, the sales-weighted average nicotine per cigarette decreased from about 2.0 mg to about 1.1 mg. (See Figure 16 of Chapter 14).

Although the average "tar" delivery of cigarettes has declined throughout the last two decades, the period from 1970 in particular reflects the growing popularity of new, lower "tar" brands. Figure 4 depicts the market share of those cigarettes with "tar" delivery 15 mg or less for 1967-78. The market share of these brands increased from about 3 percent in 1970 to an expected 30 percent in 1978. It should be noted, however, that a substantial part of the observed decline in average "tar" during this period is attributable to the reformulation of existing brands (68,69). To some extent, this continuing decline in average "tar" has been retarded by the increasing market share of longer, relatively higher "tar" brands. The market share of cigarettes 95 mm or longer has increased from 9 percent in 1967 to 28 percent in 1977 (69).

The relation between the observed increases in cigarette consumption among current smokers and the observed decline in "tar" and nicotine is not well understood. This empirical issue is of particular interest in view of the accepted conclusion that nicotine is a significant addictive component of cigarettes (Chapter 15 of this report). Studies of changes in cigarette consumption among those who voluntarily switched to lower "tar" and nicotine cigarettes (e.g., 42) have yielded equivocal results, with some smokers reporting increased consumption, many smokers reporting no change, and still others reporting a decrease. However, the underlying reasons for individual decisions to switch to a lower "tar" and nicotine cigarette may be varied and have not been thoroughly explored. It is also unclear whether the decrease in average "tar" and nicotine delivery has led to an increased consumption frequency of new initiators of cigarette smoking. This possibility is at least raised by observation of a recent increase in heavier smoking among teenagers (Table 9).

Short-term experiments which monitor individuals' changes in consumption in response to changes in cigarette "tar" and nicotine delivery have also yielded varied results (42,45). In one study (45), the dilution of cigarette smoke by means of special filters was associated with a compensatory increase in constituent intake but without a significant change in the number of cigarettes smoked. Individuals



**FIGURE 4. Market share of cigarettes with "tar" 15 mg or less, 1967—1978 (1978 projected)**

SOURCE: Maxwell, J.C.C. (27-50), Standard and Poor's Corporation (44), U.S. Federal Trade Commission (67-69).

were apparently able to compensate for the lowered "tar" and nicotine concentrations by inhaling more deeply and by smoking a greater fraction of the cigarette.

Table 10 presents some selected survey results concerning changes in the style or pattern of cigarette smoking over time. Because the data are derived from respondents' self-assessments of inhalation patterns and butt lengths, they may not be reliable. Hammond (18), for example, discarded a similar analysis of respondent-reported butt lengths because questionnaire results did not correspond to individuals' observed smoking habits.

The results in Table 10 do suggest some downward trends in the percentage of deep inhalers, but they are hardly conclusive. A change in the formulation of the National Clearinghouse on Smoking and Health questionnaire between 1966 and 1970 complicates the analysis of Category 3 in Table 10. Nevertheless, if respondent answers are to be taken at face value, there appears to be an increase in the

**TABLE 10.—Respondent-reported styles of cigarette smoking, current, regular cigarette smokers, selected categories, adults, United States, 1964—1975**

Category	1964		1966		1970		1975	
	Male	Female	Male	Female	Male	Female	Male	Female
1. Inhaling deeply into the chest	36.5%	22.5%	31.8%	15.5%	34.3%	17.5%	30.3%	16.4%
2. Inhaling almost every puff	63.1	54.8	63.0	52.1	60.5	47.2	58.5	50.7
3. Smoking cigarette as far as possible	15.9	7.5	13.5	10.0	9.6	10.4	10.9	12.9

1. In 1964 and 1966, the questionnaire response was phrased "as deeply into the chest as possible." In 1970 and 1975, the questionnaire response was phrased "deeply into the chest".

2. In each survey year, the questionnaire response was "inhale almost every puff of each cigarette."

3. In 1964 and 1966, the respondent was asked to draw a line on a diagram of a cigarette, indicating the average length of the discarded cigarette butt length. In 1970 and 1975 the verbal questionnaire response was smoking cigarette "as far as possible." The data for 1964 and 1966 correspond to those respondents indicating a discarded cigarette butt length no greater than 20mm.

SOURCE: National Clearinghouse for Smoking and Health (60,62,64)

percentage of adult female smokers who smoke their cigarettes "as far as possible."

### Research Issues

1. It remains unclear how anti-smoking publicity affects individual behavior. Available data indicate that declines in aggregate consumption during recent periods of anti-smoking publicity reflect individuals' quitting cigarette smoking. The aggregate effect of anti-smoking publicity on the rate of initiation of smoking has not been determined; similarly, its effect on individual brand choices is unclear.

2. Trends in cigarette smoking among specific high-risk groups require further investigation. A wealth of survey data is available for this purpose but has not been analyzed.

3. The relation between changes in cigarette "tar" and nicotine and changes in smoking behavior remains poorly understood. The product changes may influence the rate of initiation of cigarette smoking, the rate of cessation, and the consumption frequency of current smokers.

4. Frequent monitoring of cigarette smoking habits is critical for the design and evaluation of future public policy actions. Longitudinal studies are essential for this purpose.

### Summary

1. The per capita consumption of cigarettes decreased temporarily from 1953 to 1954, in 1964, and from 1968 to 1970. It has declined

steadily since 1973. Per capita consumption in the year 1978 was approximately 9 percent less than its peak value in 1963.

2. The observed temporary declines in per capita consumption coincided with periods of increased publicity concerning the health hazards of smoking.

3. From 1955 to 1978, the percentage of adult males who regularly smoke cigarettes declined from approximately 53 percent to approximately 38 percent. From 1955 to 1965, the percentage of adult females who regularly smoke cigarettes increased from approximately 25 percent to 32 percent. From 1965 to 1978, the prevalence of regular cigarette smoking among females declined by no more than 3 or 4 percent. In 1978, the estimated percentage of all adults who regularly smoke cigarettes reached its lowest recorded point in over 30 years.

4. During the past decade, the percentage of teenage males regularly smoking cigarettes has not declined significantly. The percentage of teenage females regularly smoking cigarettes has increased markedly and may now exceed the prevalence of regular cigarette smoking among teenage males.

5. The observed decline in the prevalence of adult male cigarette smoking occurred in all socioeconomic groups and in all age ranges. Cessation of cigarette smoking among women also occurred in all socioeconomic groups and in all age ranges, but was counterbalanced by a high rate of initiation of smoking.

6. The available data suggest that the observed temporary declines in per capita consumption from 1953 to 1954, during 1964, and from 1968 to 1970 represent primarily individuals' quitting cigarette smoking, either permanently or temporarily.

7. The available data suggest that the average cigarette consumption frequency among regular current smokers has increased over time, particularly among female smokers. Possible explanations for this effect include: (a) a supposedly higher rate of quitting among lighter cigarette smokers, (b) an increase in cigarette smoking frequency among those who continue to smoke, and (c) an increased frequency of smoking among new entrants into the population of cigarette smokers.

8. Available information on changes in the depth of inhalation, the fraction of burning cigarette actually smoked, or the length of discarded cigarette butt are inconclusive.

9. From 1950 to 1960, the market share of filtertip cigarettes increased rapidly from 0.6 percent to 50.9 percent. In 1978, the market share of filtertip cigarettes is expected to exceed 90 percent. By 1975, 85 percent of current regular smokers consumed filtertip cigarettes.

10. From 1954 to 1977, the sales-weighted average "tar" per cigarette declined from approximately 36 mg to 17 mg. The decline in average "tar" delivery was observed for both filtertip and nonfilter cigarettes. A decline in the sales-weighted average nicotine per

cigarette was also observed. These changes reflect the introduction of filtertip cigarettes, the reformulation of existing cigarette brands, a decline in the sales of relatively higher "tar" and nicotine brands, and, more recently, the rapidly increasing share of relatively lower "tar" and nicotine cigarettes. From 1970 to 1978, the market share of cigarettes with "tar" less than or equal to 15 mg has increased from about 3 percent to over 30 percent. The effects of these product changes on the composition of the cigarette smoking population and on the behavior of cigarette smokers are not well understood.

## Appendix: Cigarette Smoking in the United States, 1950-1978:

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